

ABSTRACT OF THE DISCLOSURE

5 This paper presents the fabrication and preliminary testing of a novel piezoelectric microvalve. Fabrication has three steps, which are the actuator fabrication, valve body fabrication and assembly of the microvalve. Fabricating an actuator involves cutting piezoelectric and brass beams, gluing the brass and piezoceramic beams into a trimorph sandwich structure, and curing them under pressure at elevated temperatures. Actuators are then wired either by using conductive epoxy or soldering. Valve body parts are constructed from single crystal silicon substrates using deep reactive ion etching (DRIE). DRIE is a subtractive process, whereby a mask is created on the surface of the stock, which will shield the parts that are not to be machined. Refinements in the actuator manufacturing process are made to increase the quality and decrease the fabrication time. Using a photonic probe, tip deflections of the actuators have been tested at various temperature and voltage levels. Currently, the valves are being assembled. Once assembled, multiple microvalves will undergo cold flow testing with air followed by extensive flow extensive flow testing at elevated temperatures with humidified hydrogen.